Live Training Overview

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Topics

- **Training Domains**
- **Live Training**
- **Operational/Technical Challenges**
- **LT2 Product Line Approach**

Training Domains

- **Virtual**
  - Humans in Simulators
  - Immersed into a virtual environment
  - Examples
    - Close Combat Tactical Trainer (CCTT)
    - Flight Simulators
- **Constructive**
  - Simulations
  - “Wargame”
  - Example
    - WARSIM
- **Live Training**
  - Soldiers in the field
  - Engagement Simulation
  - Instrumentation of Live Participants

Key Differences Between Constructive, Live,. And Virtual

	Constructive	Virtual	Live
Real Time Focus	▪Process all modeling events fast enough to provide realistic feedback (e.g., CPU driven)	▪Generate the virtual scene fast enough to look natural (e.g., rendering/graphics driven)	▪Transfer data as fast as a speeding bullet (e.g., data distribution driven) ▪Substantial use of wireless networks
Scenario	▪Simulated units, their initial states, and orders (e.g., initial conditions for the models)		▪The “Fairy Tale” ▪CTC use fictional countries and related activities ▪Road to War (e.g., intell reports, news reports, etc.) starts long before the unit shows up for training
Initialization	▪Put the system in the ready state		▪Put the system in the ready state ▪Capture who showed up for the exercise and why ▪Map player name/bumper number to IS entity including actual equipment / player status ▪Capture organic task organization ▪Support conducting RSOI activities as part of the exercise
Number of AARs*	▪~10	▪~50	▪~400

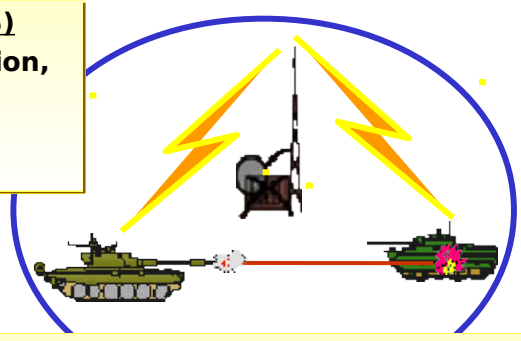
***National DIV Exercise**

Ranges

- Combat Training Centers – NTC, JRTC, CMTC
- Homestation Instrumentation Training System (HITS)
- Digital Multi-Purpose Range Complex (DPMRC)
- Military Operations in Urban Terrain (MOUT)

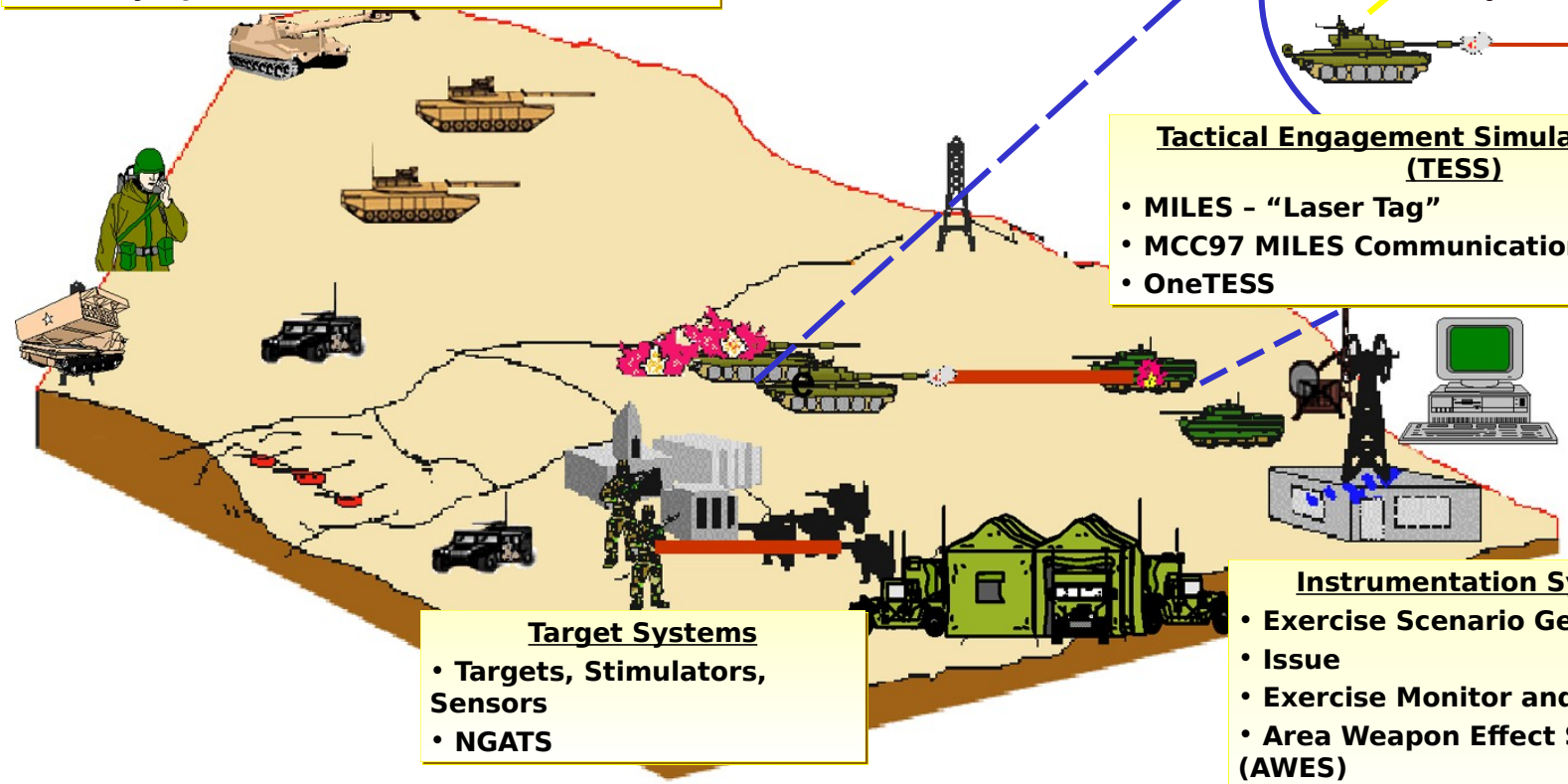
Instrumentation System (IS)

- Various systems at Homestation, CTCs
- Position Data
- Fire and Casualty Events



Tactical Engagement Simulation System (TESS)

- MILES – "Laser Tag"
- MCC97 MILES Communication Code
- OneTESS



Target Systems

- Targets, Stimulators, Sensors
- NGATS

Instrumentation System (IS)

- Exercise Scenario Generation
- Issue
- Exercise Monitor and Control
- Area Weapon Effect Simulation (AWES)
- After Action Review

Live Training Systems

- **Tactical Engagement Simulation Systems (TESS)**
  - Simulation of Battlespace phenomenon
    - Engagement (Direct Fire, Indirect Fire, IOW/IEW)
    - Engineering (Mine Clearing, Mine Laying)
    - CSS (Maintenance, Medical, Supply)
  - Systems
    - TWGSS/PGS
    - Ground TESS
    - MILES 2000
    - MILES XXI
    - OneTESS
- **Target Systems**
  - Targets that can be engaged
    - Presentation
    - Effects (Weapon, Target, Hit)
    - Shoot-Back
  - Systems
    - RETS
    - Many existing
    - NGATS

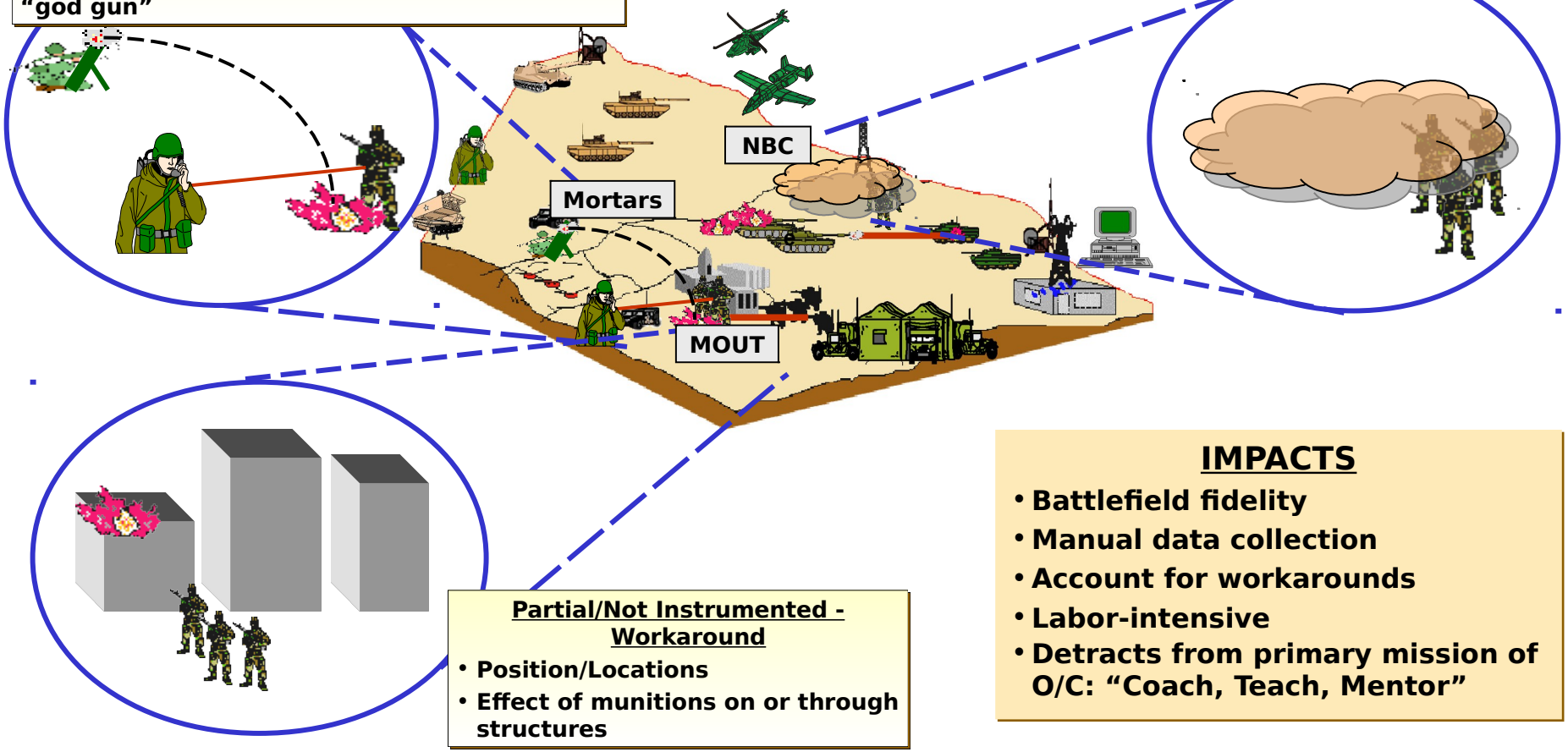
Live Training Systems, cont.

- **Instrumentation Systems (IS)**
  - Data Collection
  - Stimulation
  - Exercise Tools
    - Planning
    - Preparation
    - Monitoring and Control
    - Training Feedback
    - Recovery
  - Systems
    - Many different:
      - NTC-IS
      - CMTC-IS
      - JRTC-IS
    - Future – common based on CTIA:
      - NTC-OIS
      - CMTC-OIS
      - JRTC-OIS
      - HITS
      - MOUT-IS
      - DMPRC

Op/Training Challenge: *Battlespace Representation*

Partial/Not Instrumented - Workaround
- O/C Manually observes and records firing
- Fire markers manually provide weapon effects
- O/C assesses and eliminates player with "god gun"

Partial/Not Instrumented - Workaround
- Some capability provided by SAWE, not available everywhere
- Not Played for safety – e.g. EW
- NBC – Casualty based on MOPP



Partial/Not Instrumented - Workaround
- Position/Locations
- Effect of munitions on or through structures

IMPACTS
- Battlefield fidelity
- Manual data collection
- Account for workarounds
- Labor-intensive
- Detracts from primary mission of O/C: "Coach, Teach, Mentor"

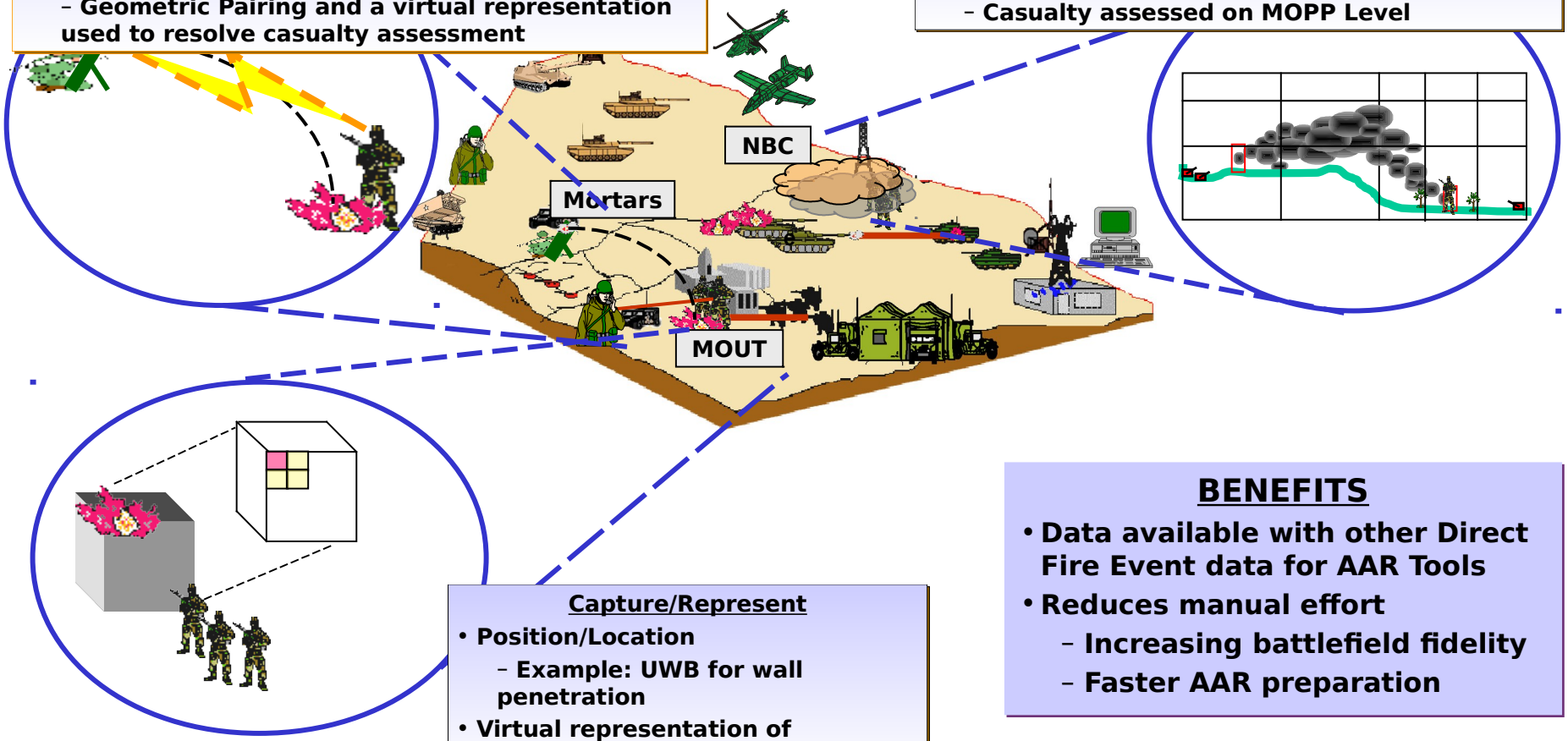
Technical Challenge: *Battlespace Representation*

Capture the Full Battlespace

- **Instrumentation for all weapons systems and platforms**
- **Example: UWB sensors to track orientation and elevation:**
  - **Geometric Pairing and a virtual representation used to resolve casualty assessment**

Representing the Full Battlespace

- **Virtual/Constructive model to complete the battlespace**
- **Example: NBC event modeled**
  - **Model moves over synthetic terrain**
  - **Casualty assessed on MOPP Level**



Capture/Represent

- **Position/Location**
  - **Example: UWB for wall penetration**
- **Virtual representation of structures**

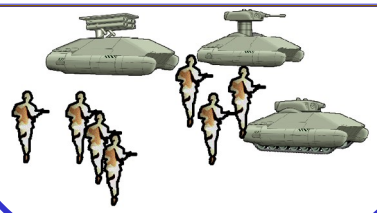
BENEFITS

- **Data available with other Direct Fire Event data for AAR Tools**
- **Reduces manual effort**
  - **Increasing battlefield fidelity**
  - **Faster AAR preparation**

Op/Training Challenge: *Army in Transformation*

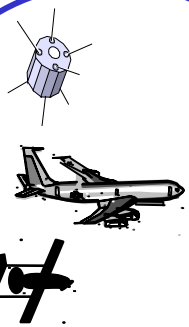
New Systems

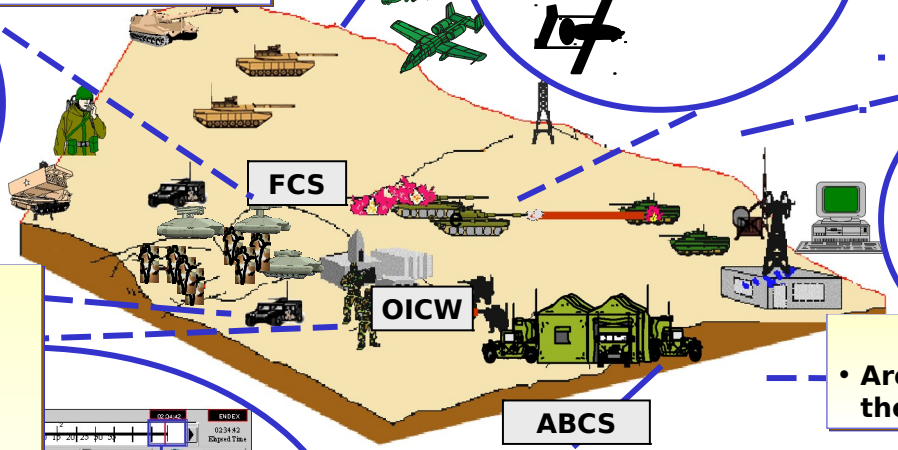
- New capabilities like NLOS, Non-Lethal, Sensors
  - Future Combat System (FCS)
  - Objective Infantry Combat Weapon (OICW)
- Current and Objective Forces in training simultaneously



Proliferation of Sensors

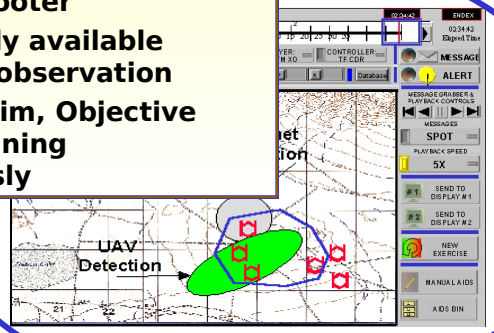
- Information dominance
- Sensors associated with new systems, e.g., FCS
- May require simulation of virtual sensors

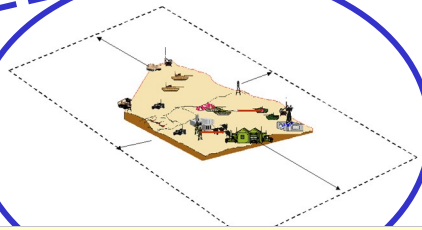




Digitized C4ISR

- Info Dominance
- Importance of Info Ops/EW
- Sensor to shooter
- Data primarily available through O/C observation
- Legacy, Interim, Objective Forces in training simultaneously





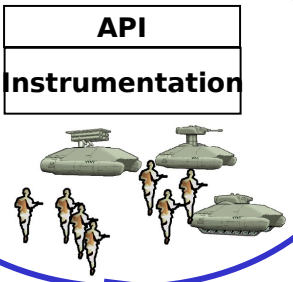
Expanded Battlespace

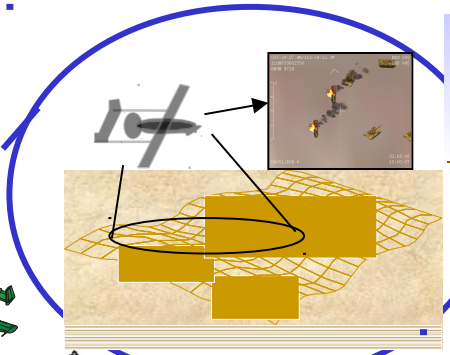
- Area of operations expands, but the training area does not

IMPACTS

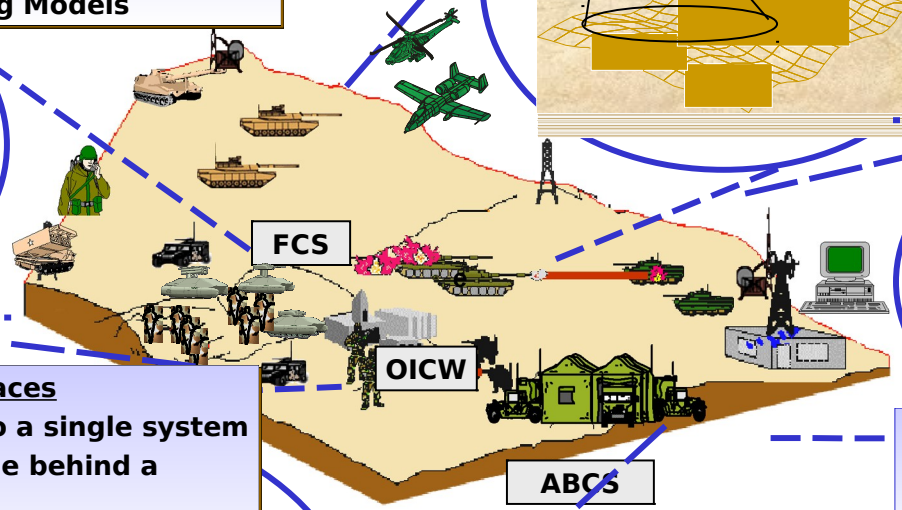
- Increases battlespace representation challenge – more workarounds or not played
- Data not available for collection without O/C intervention – missed "Battle Command Process"
- Training system must support a variety of tactical systems concurrently

Extensible System
- Expand instrumentation to support new weapons, platforms (e.g., OICW)
- Careful selection of boundaries and interfaces within the IS (e.g., Purpose-based interfaces)
- Consideration of Augmenting Models



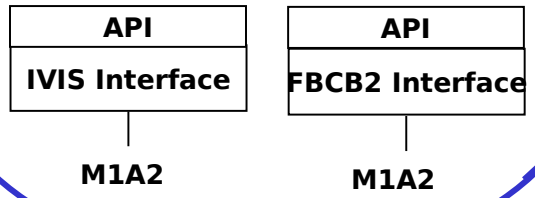


Extensible System
- Simulation of sensors using virtual or constructive models



Extensible System
- Extend area of operations with virtual and constructive models

Adaptable Interfaces
- Cannot rely on interfacing to a single system
- Support a variety of interface behind a common API
  - Example: External System Interface component

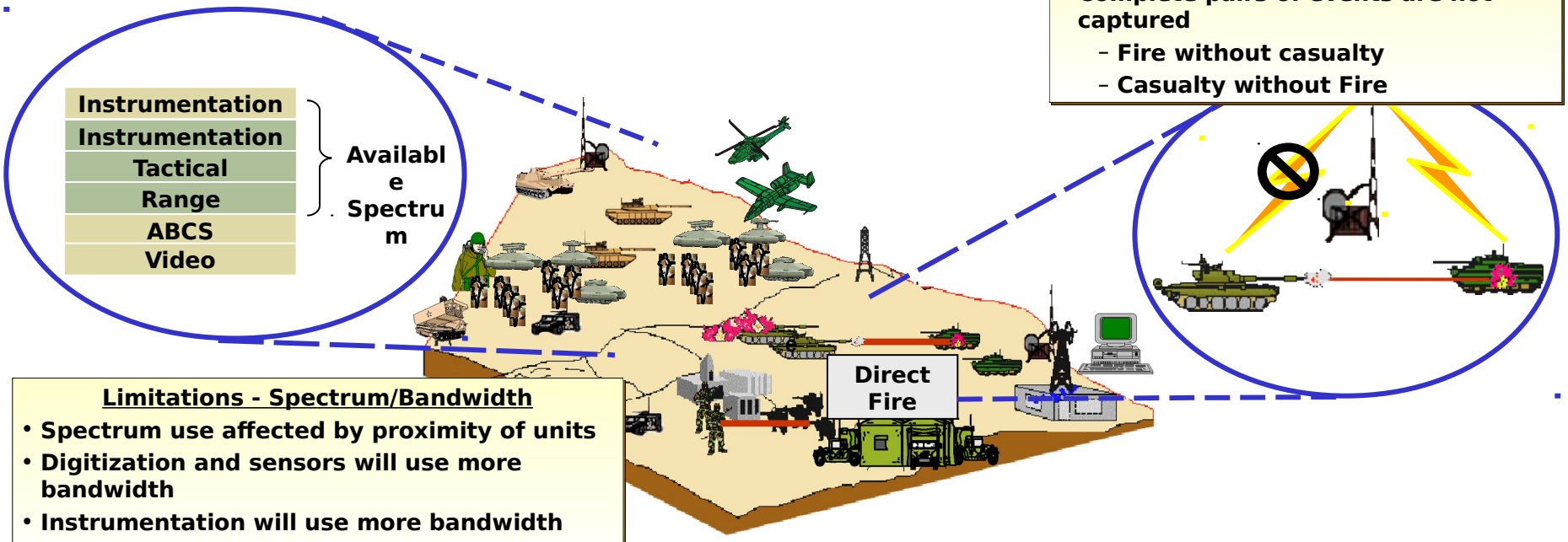


BENEFITS
- Extensible – Full battlespace is captured or represented
- Data is collected from new systems and used in the AAR
  – Capture "Battle Command Process" and support Info Ops
- Adaptable interfaces operating concurrently to support mixed force

Op/Training Challenge: *Communications*

Battlespace Events not Captured

- **Complete pairs of events are not captured**
  - **Fire without casualty**
  - **Casualty without Fire**



Limitations - Spectrum/Bandwidth

- **Spectrum use affected by proximity of units**
- **Digitization and sensors will use more bandwidth**
- **Instrumentation will use more bandwidth**
- **Users – Instrumentation, Range, Tactical**

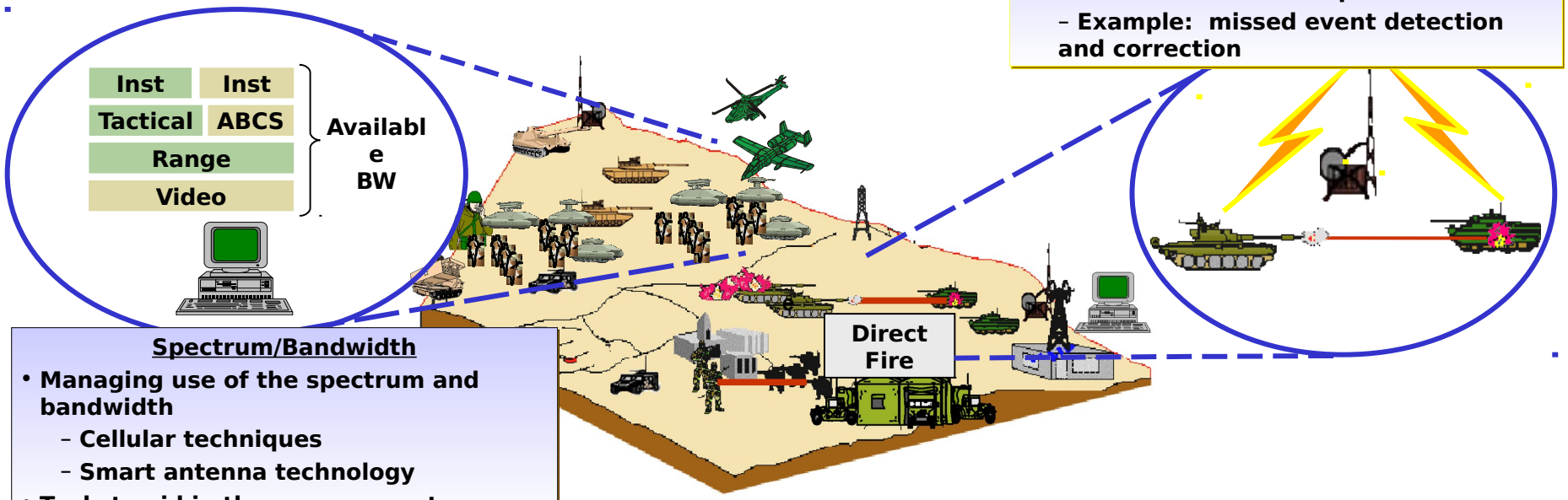
IMPACTS

- **Limitations on exercise – players, units, systems, and training assessment**
  - **Digitization/Sensors magnifies the challenges**
  - **Battle Command competes with battlefield fidelity**
- **Incomplete picture of the exercise**

Technical Challenge: *Communications*

Reliability

- Reliable communications
- Data correlation techniques
  - Example: missed event detection and correction



Spectrum/Bandwidth

- Managing use of the spectrum and bandwidth
  - Cellular techniques
  - Smart antenna technology
- Tools to aid in the management

BENEFITS

- Exercise flexibility in the presence of battlefield digitization and expansion
- Complete exercise picture is captured or recreated

Op/Training Challenge: *IS/TESS Obsolescence*

Incompatibility and Obsolescence

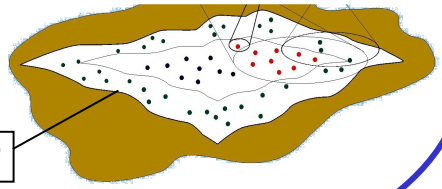
- Many different IS and TESS
  - Unique training and support for each system
  - Embedding IS and TESS is more difficult
- Training products incompatible across ranges:
  - Exercise Scenarios
  - AAR
- Higher maintenance costs for end-of-life systems

Basic MILES
SAWE/MILES II
MILES 2000

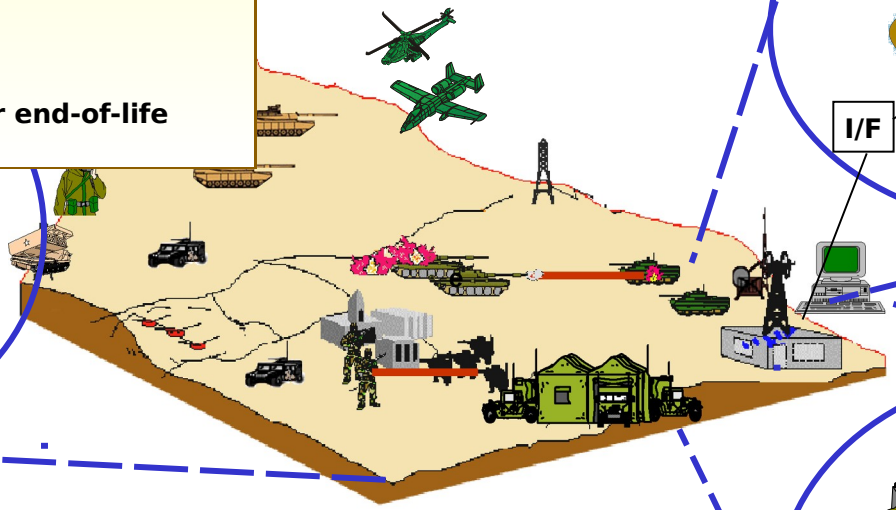
NTC IS
CMTC IS
JRTC IS

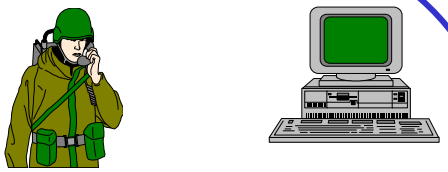
Multi-Range Exercises

- Incompatible interfaces
- Difficult to conduct exercises across ranges



I/F





LD

IMPACTS

- Support costs are increased
- Training costs are increased
- Detracts from primary mission of O/C: "Coach, Teach, Mentor"
- ***All – impact Training Assessment***

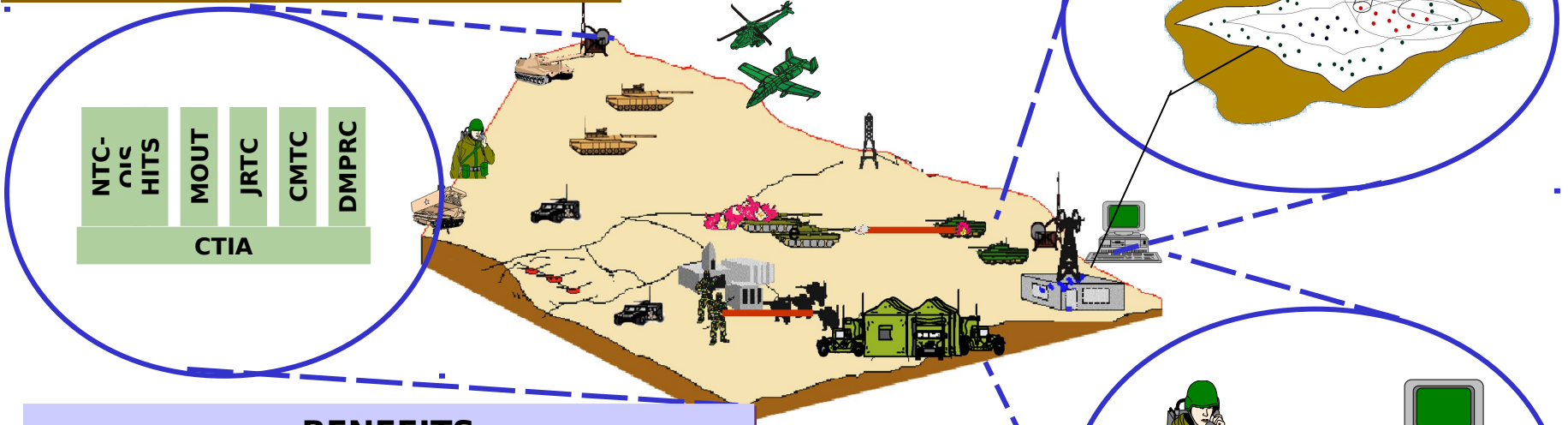
Burden on TAF and O/C

- Minimal automated tools
- No alert to high interest event for TAF or O/C
  - Example: O/C observes crossing of LD

Technical Challenge: *IS/TESS Obsolescence*

Commonality
- CTIA provides basis for commonality
  - Common IS
  - OneTESS extensions
- Support for phased legacy "replacement"

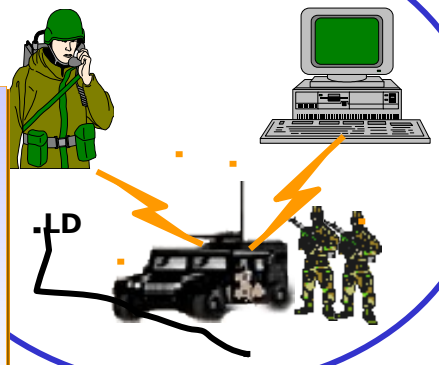
Commonality
- Common interfaces
  - Direct connect
- Common components



BENEFITS

- Reduced support costs – Commonality across and within ranges
- Reduced training costs – Common exercise products, automated tools, reduce burden
- Commonality facilitates embedding IS and TESS, interfaces
- *All – Enhanced Training Assessment Capabilities!*

Current Tools to Future Tools
- Information-centric view – Data and Tools
  - Tools available to the TAF and O/C in the field
  - Automated tools and high interest events



Operational and Technical Challenges

Operational/ Training	Technical	Benefit
Lack of full battlespace representation	Capturing and representing the battlespace	▪ Increased battlefield fidelity ▪ Faster AAR preparation
Army in transformation	Extensible and malleable architecture	▪ Full battlespace is captured or represented ▪ Support for legacy, interim, and objective force concurrently
Communications	Spectrum/bandwidth use and reliable communications	▪ Optimize spectrum use without limiting exercise ▪ Complete exercise picture is captured
IS / TESS obsolescence and incompatibility	Commonality	▪ Reduces support and training costs ▪ Facilitates embedded IS and TESS ▪ Facilitates distributed training

Solving the Technical Challenges Results in Enhanced Training Assessment Capabilities

CTIA Approach to Live Training Products

- **The LT2 Product Line consists of products that support collective, instrumented live training**
- **Products are an appropriate combination of;**
  - Instrumentation Systems components
  - TESS/Player Unit components
  - Target System components
  - External systems as needed to support the products requirements
  - All working within the CTIA specification

Live Training Transformation: Synergistic Product Lines

Domain Analysis

Component Development

Product Line Deployment

LTT Product Operational Requirements Documents

CTIA
Common LTT Product Line Architecture

TESS Component Lane

CM/CCM Models
NBC Models
BES
DI Package
Vehicle Package
NLOS RTCA
Non-Lethal RTCA
BLOS RTCA
Simulated Mine
Medical Models
NBC RTCA
EW/IOW Models

IS Component Lane

Situational Display
Database
Scenari
RCS
Exercise Control
Video
C4I
AAR

Target Component Lane

Target Control
Precision Target
Multi-sensor Target
Aerial Target
Infantry Target
Vehicle Target

NBC Models
Database
Scenario
Infantry Target
Medical Models
Legacy
NLOS RTCA
Situational Display
NBC RTCA
Non-Lethal RTCA
Video
Product Unique
DI Package
HLA
C4I

LT2 Compliant Range Product

Specific System Instantiation
(e.g., OneTESS, NTC-OIS, CMTC-OIS, HITS, DMPRC, MOUT-IS, NGATS Range System…)

Legacy
Product Unique